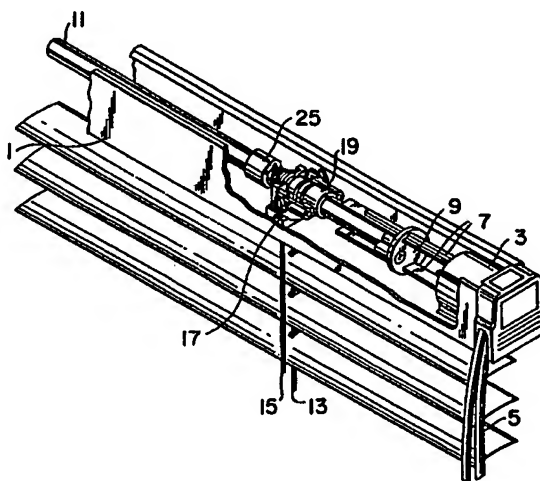




## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification <sup>5</sup> :  E06B 9/30	A1	(11) International Publication Number: WO 93/03250 (43) International Publication Date: 18 February 1993 (18.02.93)
(21) International Application Number: PCT/US92/06125 (22) International Filing Date: 23 July 1992 (23.07.92)  (30) Priority data: 739,769                      2 August 1991 (02.08.91)      US 862,843                      3 April 1992 (03.04.92)      US  (71) Applicant: GENERAL CLUTCH CORPORATION [US/ US]; 425 Fairfield Avenue, Stamford, CT 06902 (US).  (72) Inventors: RUDE, Edward, T. ; 8556 Window Latch, Co- lumbia, MD 21044 (US). WAINE, Martin ; 9 Cameroon Drive, Greenwich, CT 06831 (US).  (74) Agent: KADEN, Jeffrey, M.; Gottlieb, Rackman & Reis- man, 1430 Broadway, New York, NY 10018 (US).	(81) Designated States: AU, BR, CA, FI, HU, JP, KR, NO, Eu- ropean patent (AT, BE, CH, DE, DK, ES, FR, GB, GR, IT, LU, MC, NL, SE).  Published With international search report. With amended claims and statement.	

(54) Title: MONOCONTROL VENETIAN BLIND



## (57) Abstract

Headrail hardware to lift and tilt a Venetian blind is provided. A single control (5) operates both the lift and the tilt function. A multiturn band brake tilter (19) is used with each ladder cord (15) in a way that reduces the frictional forces encountered in lifting or lowering the blind. One end of each of the ladder cords is attached to an arm (21) of its tilter. The tilters are disposed directly about the rotating drive rod (11) with no intermediate parts, and are supported by cradles (17) that mount in the headrail rather than by the drive rod (11) as in prior art blinds. The drive rod (11) rotates the tilters (19) and the lifting mechanism until the tilters (19) contact stops built into each of the cradles (17). Further rotation keeps the blind fully tilted while lifting or lowering of the blind continues. In the preferred embodiment, the lift cords (13) are attached to the drive rod (11), which traverses to accumulate the cords (13) in a single layer as the rod (11) is rotated to lift the blind. The rotation of the rod (11) within the tilters (19) greatly reduces the lateral force needed to traverse the rod (11). An innovative bearing support (41) is provided so that the weight of the blind is transferred from the tilter (19) directly to the cradle (17), further reducing the frictional drag on the traversing rod (11).

**FOR THE PURPOSES OF INFORMATION ONLY**

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AT	Austria	FI	Finland	MN	Mongolia
AU	Australia	FR	France	MR	Mauritania
BB	Barbados	GA	Gabon	MW	Malawi
BE	Belgium	GB	United Kingdom	NL	Netherlands
BF	Burkina Faso	GN	Guinea	NO	Norway
BG	Bulgaria	GR	Greece	NZ	New Zealand
BJ	Benin	HU	Hungary	PL	Poland
BR	Brazil	IE	Ireland	PT	Portugal
CA	Canada	IT	Italy	RO	Romania
CF	Central African Republic	JP	Japan	RU	Russian Federation
CG	Congo	KP	Democratic People's Republic of Korea	SD	Sudan
CH	Switzerland	KR	Republic of Korea	SE	Sweden
CI	Côte d'Ivoire	LI	Liechtenstein	SK	Slovak Republic
CM	Cameroon	LK	Sri Lanka	SN	Senegal
CS	Czechoslovakia	LU	Luxembourg	SU	Soviet Union
CZ	Czech Republic	MC	Monaco	TD	Chad
DE	Germany	MG	Madagascar	TC	Togo
DK	Denmark	ML	Mali	UA	Ukraine
ES	Spain			US	United States of America

MONOCONTROL VENETIAN BLINDBackground to the Invention and Prior Art

Our invention relates to venetian blinds, and, more particularly to monocontrol venetian blinds that use the  
5 same operating control both for controlling the tilting of the slats, and for raising and lowering the blind.

The headrail mechanism of a venetian blind must provide for two operations; first, lifting and lowering the blind, and second, controllably tilting the slats to open or close  
10 the blind or set the slats at any desired angle. The ideal monocontrol headrail mechanism would require low operating effort, even when lifting heavy and long blinds. It would provide for accumulating the lift cords or tapes within a relatively small headrail. It would have a tilt mechanism  
15 capable of providing good closure. And finally, it would contain a minimum of parts and be easy to assemble and require a minimum of adjustment.

The prior art does contain a number of designs for monocontrol Venetian blinds. Some of them do not tilt  
20 sufficiently to provide good closure. Many of them use a large number of complex parts and are difficult to adjust.

The prior art reveals two general methods for accumulating lift cords or tapes within a Venetian blind headrail. One method is to wind the lift cords or tapes onto spools.  
25 This method suffers the two disadvantages. One disadvantage is that the cords or tapes do not wind evenly onto their respective spools, and very slight differences in diameter produce easily noticeable unevenness in the blind as it is raised. The other disadvantage is that the mechanical  
30 advantage of the lift mechanism decreases as the diameter of the accumulated cord or tape increases on the spools. This progressive decrease in mechanical advantage occurs as the lift cords support more of the blind's weight, causing a large increase in the effort required to further lift the

-2-

blind. The mechanical advantage decreases just when it should increase.

The other, and preferred method is to accumulate the cords onto a shaft that moves laterally, or traverses, so  
5 that the lift cords wind in a single layer onto the shaft. This insures even winding of each of the lift cords, and it maintains a constant mechanical advantage so that the lifting effort increases only in proportion to the weight supported by the lift cords. Several methods have been used to  
10 produce the traversing of the rod. A rack and gear arrangement has been used. U.S. Patent No. 1,343,527 reveals a lead screw and nut to accomplish the traversing. Another method, one that is free of any gears or leadscrews, is revealed in U.S. Patent No. 4,625,012 in which the lift  
15 cords, acting on cam features of their supporting cradles, produce the lateral forces to traverse the rod. Although, this method is presently used in a variety of blinds that lift from the bottom, it was not believed that the method could work with Venetian blinds because it was expected that  
20 the weight of the blinds hanging on the tilters would add so much frictional drag that the rod would not traverse properly.

The headrail mechanism must also provide for tilting the slats of a Venetian blind. In a monocontrol blind that  
25 employs a traversing rod on which to accumulate the lift cords, the tilt mechanism must rotate in either direction along with the traversing rod until the position for full closure is reached. Thereafter, the tilt mechanism must slip, maintaining its position, while the blind is raised or  
30 lowered. In a traversing rod monocontrol Venetian blind, the drive shaft for the tilt mechanism is the traversing rod. The ladder cords are attached to the tilter mechanism. Generally, in a monocontrol blind, there will be one tilter mechanism for each ladder cord in the blind. The best  
35 tilting results if the ladder cords are attached to the tilter at a separation equal to the width of the slats.

-3-

Furthermore, a line between these attachment points should pass through the centerline of the traversing rod. This will keep the tilter at the same angle as the slats. If this geometric relationship is not maintained, then it will  
5 be necessary for the tilt mechanism to be capable of lifting the blind if full closure is to be achieved.

In a Venetian blind having separate lift and tilt mechanisms, there is no difficulty in providing a tilt mechanism capable of lifting the weight of the entire blind.  
10 However, in a traversing rod monocontrol blind, the traversing rod must drive both the tilt and the lift mechanisms. When the fully tilted position is reached, the tilt mechanism must partially disengage and slip, providing, thereafter, sufficient torque to maintain full tilt as the rod  
15 continues to rotate for lifting or lowering the blind. Whatever force is needed to maintain full tilt is added to the effort required to lift the blind. This force will be minimum if, (a) the tilter geometry is as described above, and (b) if the tilter mechanism is capable of adjusting its  
20 grip on the traversing rod to provide only that amount of torque needed to maintain full tilt. Furthermore, the smaller the separation of the two sides of the ladder cords at full tilt, the better the closure will be. This last requirement will be best satisfied if the tilters are mount-  
25 ed directly on the traversing rod. Any intermediate part between the tilters and the rod will increase the separation of the ladder cords at full tilt. U.S. Patent No. 4,697,630 reveals a tilter mechanism which has good gripping torque between extremes of tilt while partially releasing its grip  
30 when full tilt is reached. This tilter is made in the form of a multiturn helical band clutch which grips the traversing rod during tilting. When the position for full tilt has been reached, the leading end of the tilter contacts a stop which prevents further movement of the tilter and partially  
35 releases the grip of the tilter on the rod, thereby limiting the frictional drag of the tilters on the rod to just that

-4-

amount of torque required to maintain the fully tilted condition of the blind. The rod can continue to rotate, winding or unwinding the lift cords to raise or lower the blind according to the direction in which the rod is being  
5 rotated.

U.S. Patent Numbers 2,737,235, 2,758,644, and 3,352,349, describe prior art monocontrol Venetian blinds that employ a variety of traversing rod lift mechanisms. In order to achieve traversing in each of the prior art blinds  
10 it is necessary to overcome all of the frictional force due to the weight of the blind acting on the traversing rod. The grip of the tilt mechanism on the traversing rod must be sufficient to ensure complete closure. And, of course, both the tilt force and the drag on the rod must be overcome to  
15 cause the rod to traverse. These frictional forces are large enough to make these blinds very difficult to operate. It is, therefore, not surprising that Venetian blinds using this type of mechanism have never been popular.

#### Summary of the Invention

20 The desirable characteristics of the helical band tilter of U.S. Patent No. 4,696,630 can be combined with the traversing rod system according to U.S. Patent No. 4,623,012 to produce a Venetian blind that has monocontrol operation and accumulates the lift cords within the headrail. This  
25 combination has been tried and found to be unsatisfactory because the tilters impose so much frictional drag on the traversing rod that it does not traverse reliably. Our invention consists in providing a novel bearing arrangement that removes much of this frictional drag. In the preferred  
30 embodiment, the band clutch of U.S. Patent No. 4,697,630 is modified so that the tilter is supported directly by the cradle rather than by the traversing rod. This greatly reduces the frictional forces on the traversing rod which improves the reliability of operation. The blind has good  
35 closure, and yet it is easy to raise and lower. It has a small number of parts and is easy to assemble and adjust.

-5-

The inventive combination has the advantages of both the tilting mechanism and the lifting mechanism without the problem of sliding the rod against large frictional forces found in prior art blinds.

5           The use of the helical wrap band clutch tilter is crucial because it alone, among the various know methods for driving the tilters in a monocontrol blind, is capable of providing large friction when needed during tilting, while controlling the frictional forces between the tilters and  
10 the traversing rod to the minimum amount needed to maintain full tilt. Other methods that employ a predetermined frictional connection between the rod and the tilter must, due to the variability of frictional forces, provide an excess of frictional force to ensure good closure of the blind.  
15 This extra force adds undesirably to the effort of operating the blind. U.S. Patent No. 3,352,349 reveals a monocontrol Venetian blind using a traversing rod and a tilter which frictionally grips the traversing rod. Lift cord carrier 15 is "arranged in a slightly clamping manner" on operating  
20 shaft 2. But experience has shown that the tilter must grip the operating shaft tightly during tilting to provide good closure of the blind, and the friction from this tight grip will require the exertion of large forces by the traversing mechanism to cause the shaft to slide.

25           In a fully extended Venetian blind, the ladder cords support the entire weight. As the blind is raised, weight is transferred to the lift cords. When the blind is fully raised, virtually the entire weight of the slat pack and the bottom rail are supported by the lift cords. The ladder  
30 cords are attached to the tilters, so whatever supports the tilters must also support the weight of the extended portion of the blind. The normal forces between the tilters and their supports, and the resulting friction caused thereby, can make traversing difficult when the blind nears full  
35 extension. At that time the tilters are supporting most of the weight, producing maximum friction, and the tension in

-6-

the lift cords, which is needed to produce the traversing motion, is at its minimum value.

It is surprising that it is possible to produce sufficient tilt drive without burdening the traversing mechanism with so much friction that traversing fails. The reason that it is possible can be understood as follows. The force needed to produce relative motion between two fictionally coupled objects is greater if only that force is active than it is if another force is also causing motion, even if that motion is in a different direction. For instance, referring to FIG. 1, the force,  $F_1$ , needed to slide an object of weight  $W$  across a horizontal surface equals  $uW$ , where  $u$  is the coefficient of friction between the object and the surface. But if the object is moving under the action of two perpendicular forces,  $F_1$  and  $F_2$ , then it is the vector sum of  $F_1$  and  $F_2$  that equals  $uW$ , and as seen in FIG. 2, in which  $A$  is the angle between  $F_2$  and the actual direction of motion. In this situation, both  $F_1$  and  $F_2$  are smaller than  $uW$  and, if the angle  $A$  is small,  $F_1$  will be far smaller than  $uW$ .

In our case,  $F_2$  corresponds to the force causing the rod to rotate, which forces it to slip within the tilter, and  $F_1$  corresponds to the force required to cause the rod to traverse. In a typical embodiment of our invention, we have use a rod of 0.375" diameter, and lift cords of about 0.040" diameter. Since the rod rotates one complete revolution while traversing only a distance equal to the thickness of the cord, the surface motion in the rotational direction is about 30 times the motion in the traversing direction, making the angle  $A$  quite small, somewhat less than 2 degrees. In this case, the force,  $F_2$ , which causes the rotational motion does most of the work against friction, and  $F_1$  is only about 3% of what it would have to be to cause the traversing motion in the absence of  $F_2$ . In a blind having an intermediate piece between the tilter and the drum, the full amount of work must be done at both interfaces, between



-7-

the tilter and the drum, and between the drum and the rod. As the entire amount of work must be provided by the operator of the blind, this considerably increases the effort required to operate the blind.

- 5        It has been found necessary, in very long blinds that use the tilter of U.S. Patent No. 4,697,630, to add weight to the bottom rail to insure that the traversing rod returns fully to its starting position. In the preferred embodiment of our invention great improvement is achieved by modifying  
10 the tilter and cradle so that the tilter is supported directly by a bearing surface on the cradle rather than by the traversing rod. The improved performance comes from the reduction in formal forces between the rod and the tilters. This greatly reduces the force needed to traverse the rod.  
15 In the earlier system, the force required to cause traversing increased just as the force available to cause traversing was decreasing. In this, preferred embodiment while the force available to cause traversing still decreases as the blind is lowered, the frictional force impeding the traversing  
20 motion of the rod remains constant and small.

Accordingly, it is an object of our invention to provide a monocontrol lift and tilt mechanism for a Venetian blind that requires minimal effort to operate and which maintains constant mechanical advantage during lifting.

- 25        It is another object of our invention to provide a monocontrol lift and tilt mechanism for a Venetian blind with low operating effort in lifting heavy and long blinds.

- It is a further object of our invention to provide a monocontrol lift and tilt mechanism for Venetian blinds  
30 which can lift long blinds in a relatively small headrail.

Another object of our invention is to provide a monocontrol lift and tilt mechanism for Venetian blinds which can exert enough torque to ensure good closure.

- A further object of our invention is to provide a  
35 monocontrol lift and tilt mechanism for Venetian blinds

-8-

which permits the close alignment of the ladder cords at the positions of full tilt.

Still another object of our invention is to provide a monocontrol lift and tilt mechanism for Venetian blinds in which the entire torque required for tilting does not have to be reacted during raising of the blind.

Yet a further object of our invention is to provide a monocontrol lift and tilt mechanism for Venetian blinds having a minimum of component parts and which can be easily assembled and adjusted for proper operation.

Brief Description of the Drawings

Further object, features and advantages of our invention will become apparent upon consideration of the following detailed description in conjunction with the drawings, in which:

FIG. 1 is a vector diagram of the force  $F_1$ , equal to  $uW$  in this situation, needed to cause traversing in the absence of other motion;

FIG. 2 is a vector diagram of the forces  $F_1$  and  $F_2$  and their resultant  $uW$ , where  $F_1$ , now much smaller than  $uW$ , is the force needed to cause traversing in the presence of other motion at the same interface;

FIG. 3 is an isometric view of a Venetian blind headrail that has been cut away to reveal the parts within;

FIG. 4 is an enlarged view of a portion of the mechanism of FIG. 3 to better show the detail of the lifting and tilting parts and the inventive feature of the preferred embodiment of our invention;

FIG. 5 is an enlarged side elevation and partial cross-sectional view according to the prior art of a lift tilt mechanism at one of the lift points, showing a tilter, the traversing rod and a cradle;

FIG. 6 is a similar of the same components, in this case, showing the tilter supported by the cradle according to the principles of our invention;

-9-

FIG. 7 is a view of the same components as in FIG. 5 but shown during lifting of the blind and, thus, with the tilter rotated 90 degrees; and

FIG. 8 is an enlarged side elevation and partial cross-sectional view of another embodiment of our invention that employs a spool with either cord or tape for lifting the blind.

Detailed Description of the Drawings

The general organization of the lift system within the headrail can be seen in FIG. 3. Headrail 1 can be of any convenient cross-sectional shape having sufficient interior space to accommodate the hardware. Holding mechanism 3, which could be any of a wide variety of devices, is preferably mounted at an end of headrail 1, although other placements are possible. Some appropriate operating means is needed for operating holding mechanism 3. In this case cord loop 5 is shown, although any of a number of other combinations of holding mechanism and operating means might be used instead. Splines 7 are attached to the output of holding mechanism 3. Splines 7 together with disk 9 which is attached to traversing rod 11 form an axially slidable torque carrying connection between holding mechanism 3 and traversing rod 11. The particular spline and disk arrangement shown here for making the connecting to the holding mechanism is intended only as an example, and other means for accomplishing the connection may be used without deviating from the intent and purpose of our invention.

The remaining parts within the headrail are associated with the attachment, control, and operation of lift cord 13 and ladder cord 15. One such set would, ordinarily, be provided for each set of lift and ladder cords. The identification of parts, forces, and descriptions of operation are made for one set of these lift and tilt components, and are intended to apply to the other sets as well. In some blinds, a partial set of components may be used in one or more locations. For instance, blinds often have three

-10-

ladder cords but only two lift cords. This is done when two lift cords are sufficient to lift the blind, but a central ladder cord is still needed for proper support of the slats. In such cases, the operation of the blind remains the same as it relates to the components in the incomplete set.

Cradle 17 and tilter 19 are arranged generally in accordance with the principles of U.S. Patent No. 4,697,630. Each of the side of ladder cord 15 is attached to one of the two arms 21 of tilter 19 as best seen in FIG. 4. Lift cord 13 is arranged generally in accordance with the principles of U.S. Patent No. 4,623,012, entering the headrail through a hold in the bottom of the rail, passing over roller 23, seen in FIG. 5, and terminating in its attachment to rod 11 by means of clip 25 or by any other suitable means.

FIG. 5 shows the prior art combination of a traversing rod lift system according to the principles of U.S. Patent No. 4,623,012 with a helical band tilter according to the principles of U.S. Patent No. 4,697,630. Traversing rod 27 is supported directly by cradle 29 whose bearing surface 31 is shaped to accept rod 27. Tilter 33 is disposed about and entirely supported by rod 27.

FIG. 6 shows the tilt and lift components of our invention with the slats in a horizontal position. In this view, arms 21, shown in FIG. 4, but omitted from FIG. 5 for clarity, would lie in the horizontal plane passing through the center of rod 35. Tilter 37 is wrapped about rod 35 as in the earlier embodiment, but in this case the tilter has bearing 39 which is supported at bearing surface 41 on cradle 43. Flange 45 at the end of tilter 37 forms a retaining barrier to prevent axial movement of tilter 37 in relation to cradle 43 along rod 35. The outer surface of flange 45 is angled to form camming surface 47 according to the principles of U.S. Patent No. 4,623,012. The angle is shown in FIG. 6 as angle A. The desirable size of angle A depends upon the ratio of the diameter of lift cord 47 to the diameter of the rod. Sufficient movement must be produced by the

-11-

camming action to provide space for the incoming cord so that it will not override the previous turns. When the blind is fully lowered and most of the weight is hanging from the blind's several ladder cords, then very little of the blind's weight is supported at the surface between rod 35 and tilter 37. Instead, most of the weight is supported at bearing surface 41 between cradle 35 and tilter 37. This reduction of frictional force between the tilter and the traversing rod allows the rod to be moved much more easily. With this improved bearing support for tilter 37, much less tension in lift cord 49 is needed to insure the complete return of traversing rod 35 to its starting position as the blind is fully lowered.

FIG. 7 shows the same components as shown in FIG. 6 but during lifting of the blind. Lift cord 49, as it is wound onto rod 35, contacts camming surface 47, forcing rod 35 to traverse to the left, away from the camming surface. Tilter 37 is fully rotated to the limit permitted by stop 51 which loosens the grip of tilter 36 on rod 35, retaining only sufficient grip to maintain its orientation. In this position, arms 53 are roughly vertical, and the ladder cords, of which only the near one, ladder cord 55 is visible, are in the fully tilted position.

The mechanism of U.S. Patent No. 4,632,012 has no tilter. The camming surface is formed as a part of the cradle. In our invention, the cord comes into contact with the tilter flange. Therefore it is necessary to incorporate the camming surface onto this flange. One of the features of our inventive blind is that it can be raised by rotating the rod in either direction. This requires that the camming surface be on the right side when the blind is being lifted by counterclockwise rotation of the rod, and on the left for the opposite rotation. When the blind is being raised, the tilter rotates 90 degrees in the direction of the rod's rotation. This orients camming surface 47 properly for that winding direction of the lift cord. The camming action

-12-

takes place in about a one hundred and twenty degree arc between the point where the cord first contacts the shaft and the top of the shaft. When tilter 37 is horizontal, as seen in FIG. 6, camming surface 47 occupies the lower portion of flange 45. As the tilter rotates 90 degrees one way or the other, the camming surface rotates into the required orientation.

In another embodiment of our invention, tilters are also supported directly by the cradles rather than by the operating rod which, in this case does not traverse, but simply rotates. In this type of monocontrol blind, lifting is accomplished by winding the tape or cord onto spools. Although there is no traversing rod in this type of blind, the reduction of operating friction remains a serious issue to which great amounts of effort have been directed, even to the extent that production tooling has been replaced several times to achieve small improvements in the operating "feel" of blinds made with this hardware. FIG. 8 show the lifting and tilting components for this embodiment that correspond to the components of the preferred embodiment shown in FIGS. 5 and 6. Rod 57 has tilter 59 disposed thereabout. Tilter 59 has bearing groove 61 which rotates on and is supported by bearing surface 63 of cradle 65. Cradle 65 is similar to cradle 37 of the preferred embodiment except that in place of a roller to guide a lift cord, it has a slot 67 to guide cord or tape 69 onto spool 71. Since there is no traversing of the rod in this case, spool 71 is firmly attached to rod 57 so as to rotate with it. As before, tilter 59 must rotate with rod 57 until reaching its stop. Thereafter, it must remain in position, maintaining full tilt, while rod 57 continues to rotate within it to raise or lower the blind. The control of friction is important in this case to insure that there be sufficient grip of the tilter on rod 57 to produce full tilt. But any additional frictional drag between these parts will simply add to the effort of operating the blind. A significant savings in operating effort is

-13-

obtained by shifting the support load from rod 57 to bearing surface 63 of cradle 65. Because in this embodiment the rod does not traverse, there is no requirement for a camming surface, and flange 73 of tilter 59 can have an exterior surface normal to the axis of rod 57.

It will thus be seen that the objects set forth above among those made apparent from the preceding description, are efficiently attained and, since certain changes may be made in the construction of the inventive spring clutch without departing from the spirit and scope of the invention, it is intended that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

It is also to be understood that the following claims are intended to cover all of the generic and specific features of the invention herein described and all statements of the scope of the invention which, as a matter of language, might be said to fall therebetween.

-14-

CLAIMS

What is claimed:

1. A combination monocontrol tilt and lifting system for venetian blinds comprising:
  - 5 a rod rotatable along the axis thereof in two directions;  
at least one multiturn helical tilting member rotatable gripping said rod and attached to the ladder cords of said blinds;
  - 10 means for at least partially loosening the tilting member with respect to the rod at positions corresponding to full tilt for either direction of rotation;  
at least one lift cord attached to said rod and responsive to rod rotation for wrapping around and unwinding
  - 15 from said rod; and  
means for supporting said at least one helical member comprising at least one cradle located substantially where said at least one lift cord is attached to the rod.
2. The system of claim 1, wherein said rod comprises
- 20 a traversing rod.
3. The system of claim 2, further comprising:
  - first means for applying a lateral force on said traversing rod in a first direction as said lift cord is wrapped around said rod.
- 25 4. The system of claim 1, wherein said loosening means comprises means for restraining rotatable movement of said tilting member at said full tilt positions.
5. The system of claim 4, wherein said restraining means comprises at least one stop for loosening the grip of
- 30 said tilting member on said rod at said full tilt positions.
6. The system of claim 1, wherein said at least one tilting member includes a central portion configured for gripping the rod and two arms for receiving the ends of said ladder cords.



-15-

7. The system of claim 1, wherein said at least one tilting member is flexible.

8. The system of claim 1, wherein the inside diameter of the at least one tilting member is substantially equal to  
5 the outside diameter of the rod such that the weight of the venetian blinds causes tightening of the at least one tilting member about the rod.

9. The system of claim 1, wherein the at least one tilting member is mounted directly on the rod in the absence  
10 of any intermediate member.

10. The system of claim 1, wherein said cradle includes an opening through which said ladder cords pass.

11. The system of claim 3, wherein said first applying means includes a camming surface against which said lift  
15 cord bears to enable said rod to lateral move in said first lateral direction.

12. The system of claim 11, wherein said camming surface is configured such that rotation of said traversing rod for wrapping said lift cord thereabout causes said rod  
20 to move in a lateral direction.

13. The system of claim 12, wherein said camming surface is configured such that rotation of said rod wraps the lift cord on said rod in a single layer.

14. The system of claim 1, wherein said at least one  
25 helical member includes a protruding flange for maintaining the axial position of said helical member with respect to said cradle member.

15. The system of claim 14, wherein said flange includes a camming surface against which said lift cord bears  
30 to enable said rod to traverse.

16. The system of claim 15, wherein said camming surface of said flange is disposed at an angle which depends upon the dimensions of the rod and the lift cord.

## AMENDED CLAIMS

[received by the International Bureau on 29 December 1992 (29.12.92);  
original claims 2 and 3 cancelled;  
original claim 1 amended;  
claims 4 - 16 unchanged but renumbered as claims 2 - 14 (2 pages)]

## What is claimed:

1. A combination monocontrol tilt and lifting system for venetian blinds comprising:
  - 5 a traversing rod rotatable along the axis thereof in two directions;  
at least one multiturn helical tilting member rotatable gripping said rod and attached to the ladder cords of said blinds;
  - 10 means for at least partially loosening the tilting member with respect to the rod at positions corresponding to full tilt for either direction of rotation;  
at least one lift cord attached to said rod and responsive to rod rotation for wrapping around and unwinding
  - 15 from said rod; and  
means for applying lateral force on said traversing rod in a first direction as said lift cord is wrapped around said rod;
  - means for supporting said traversing rod comprising
  - 20 ing at least one cradle having a surface adapted to accept said and located substantially where said at least one lift cord is attached to the rod, said cradle further having a surface for supporting said tilting member in order to reduce frictional drag on the rod.
- 25 2. The system of claim 1, wherein said loosening means comprises means for restraining rotatable movement of said tilting member at said full tilt positions.
3. The system of claim 2, wherein said restraining means comprises at least one stop for loosening the grip of
- 30 said tilting member on said rod at said full tilt positions.
4. The system of claim 1, wherein said at least one tilting member includes a central portion configured for gripping the rod and two arms for receiving the ends of said ladder cords.
- 35 5. The system of claim 1, wherein said at least one tilting member is flexible.

6. The system of claim 1, wherein the inside diameter of the at least one tilting member is substantially equal to the outside diameter of the rod such that the weight of the venetian blinds causes tightening of the at least one tilting member about the rod.

7. The system of claim 1, wherein the at least one tilting member is mounted directly on the rod in the absence of any intermediate member.

8. The system of claim 1, wherein said cradle includes an opening through which said ladder cords pass.

9. The system of claim 1, wherein said applying means includes a camming surface against which said lift cord bears to enable said rod to lateral move in said first lateral direction.

10. The system of claim 9, wherein said camming surface is configured such that rotation of said traversing rod for wrapping said lift cord thereabout causes said rod to move in a lateral direction.

11. The system of claim 10, wherein said camming surface is configured such that rotation of said rod wraps the lift cord on said rod in a single layer.

12. The system of claim 1, wherein said at least one tilting member includes a protruding flange for maintaining the axial position of said helical member with respect to said cradle member.

13. The system of claim 12, wherein said flange includes a camming surface against which said lift cord bears to enable said rod to traverse.

14. The system of claim 13, wherein said camming surface of said flange is disposed at an angle which depends upon the dimensions of the rod and the lift cord.

## STATEMENT UNDER ARTICLE 19

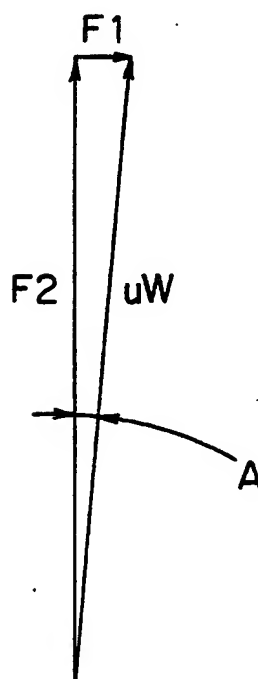
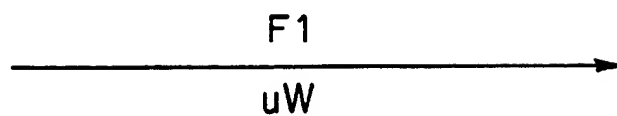
In response to the International Search Report dated October 29, 1992, applicant has amended the application in order to better recite the invention thereof. The invention is now recited in the new claims found on replacement sheets 14-15.

More specifically, claim 1 has been amended to recite that the combination monocontrol tilt and lifting system for venetian blinds includes a cradle for supporting both the traversing rod and tilting member in order to reduce frictional drag on the rod. The cradle has a surface which is adapted for accepting and supporting the rod and a surface for also supporting the tilting member.

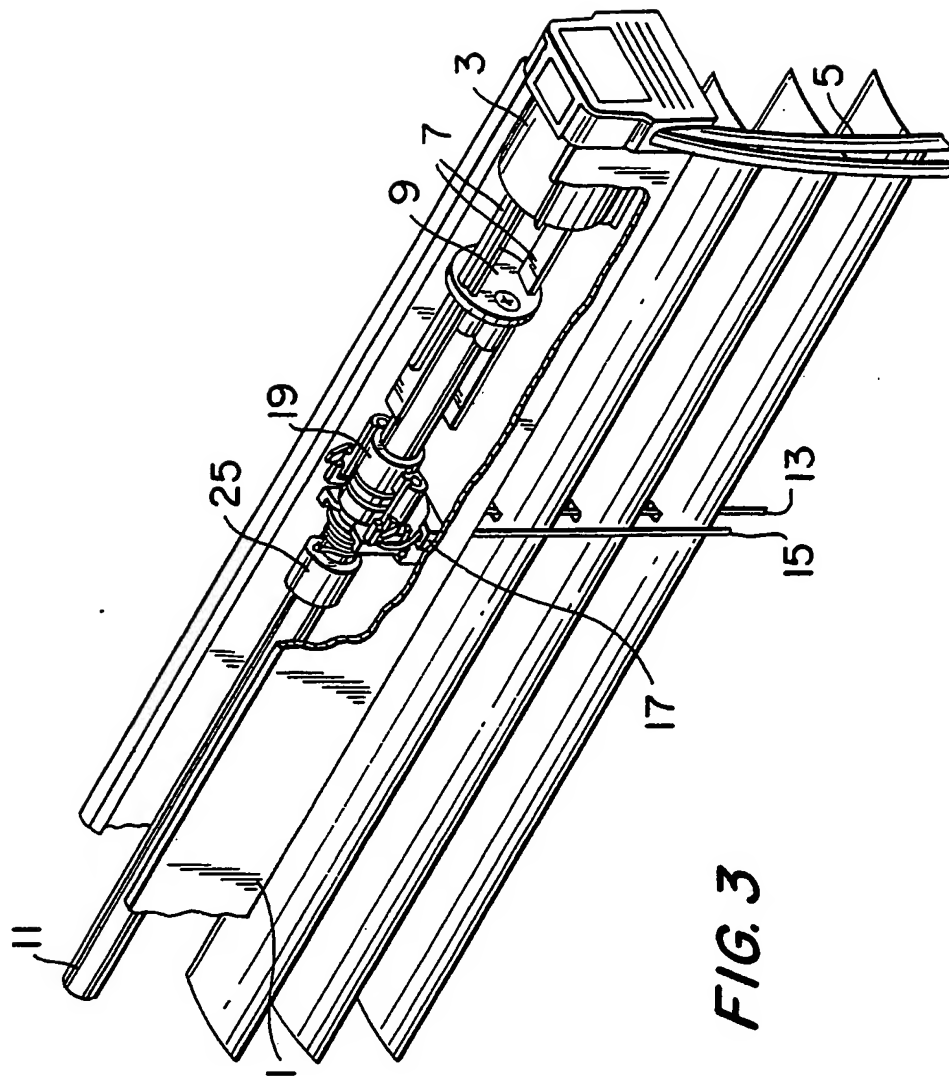
In contrast to the cited prior art the tilting member is supported directly by the cradle as opposed to the traversing rod. Thus, the frictional force on the traversing rod is substantially reduced, improving the reliability of operation.

Accordingly, the invention recited in the claims now presented is directed to subject matter which is patentably distinguishable from all of the references cited in the International Search Report.

1/7

*FIG. 1**FIG. 2*

SUBSTITUTE SHEET



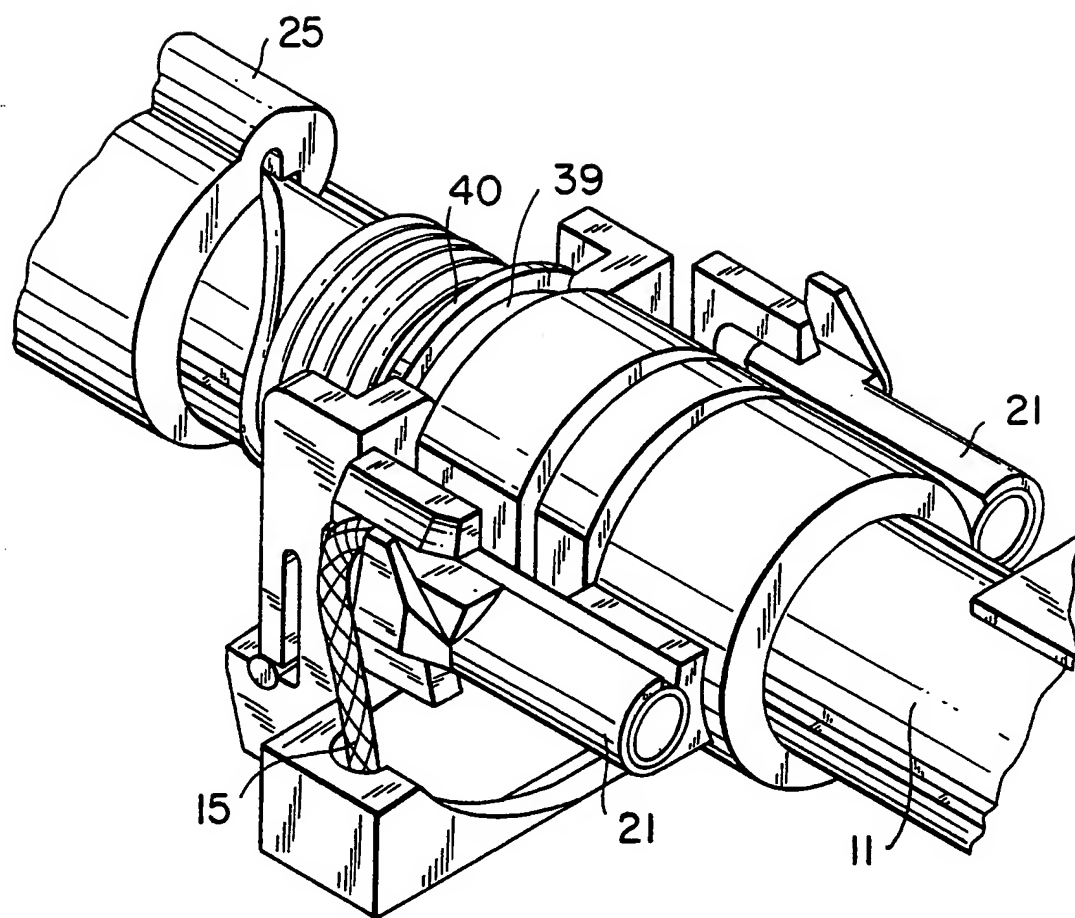
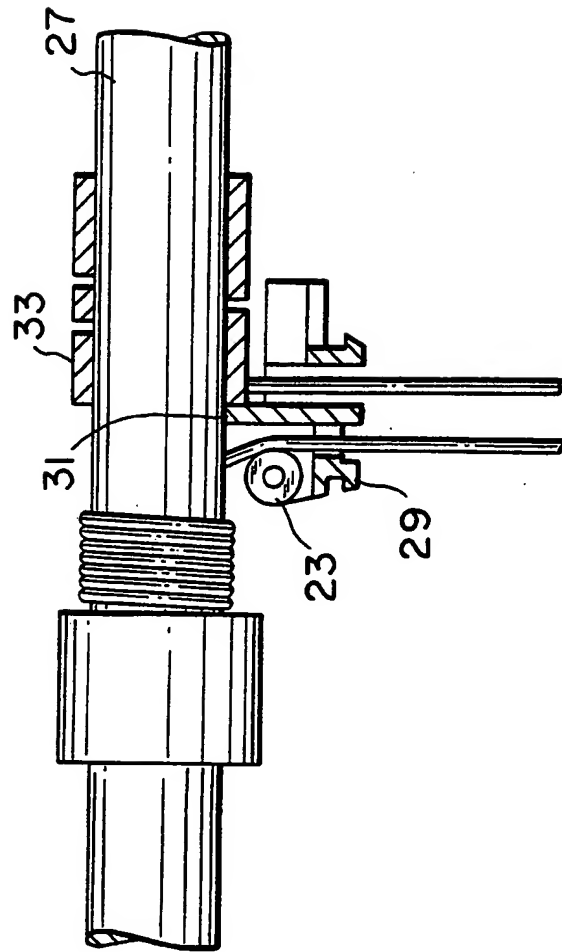
**FIG. 4****SUBSTITUTE SHEET**

FIG. 5



SUBSTITUTE SHEET



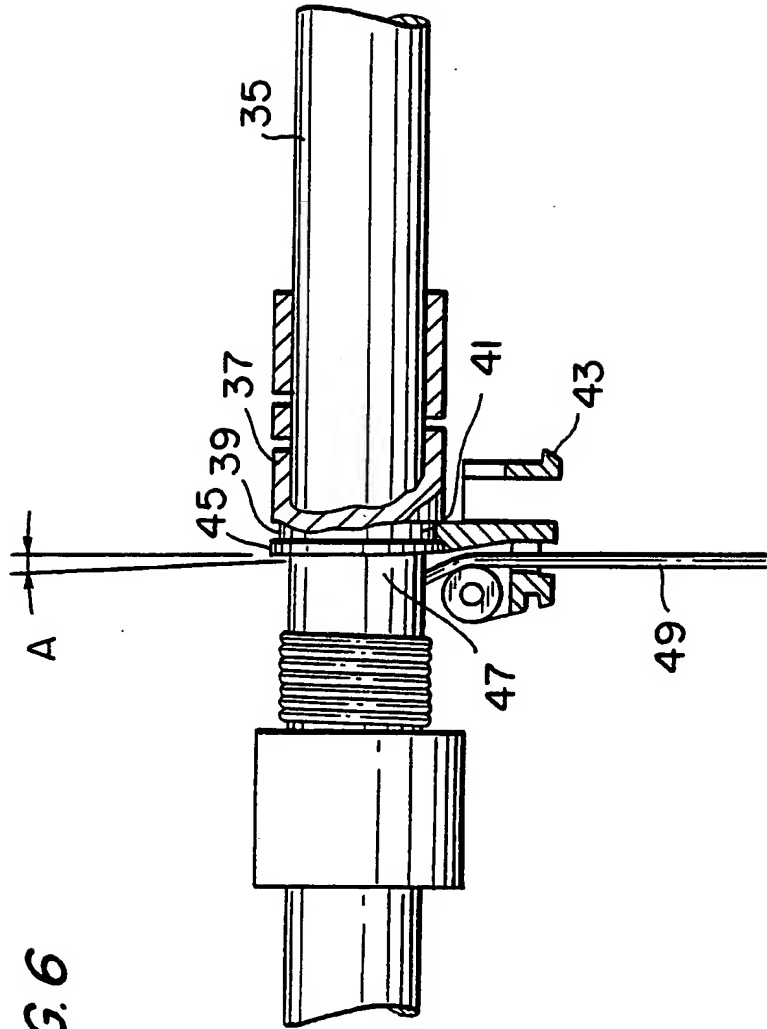
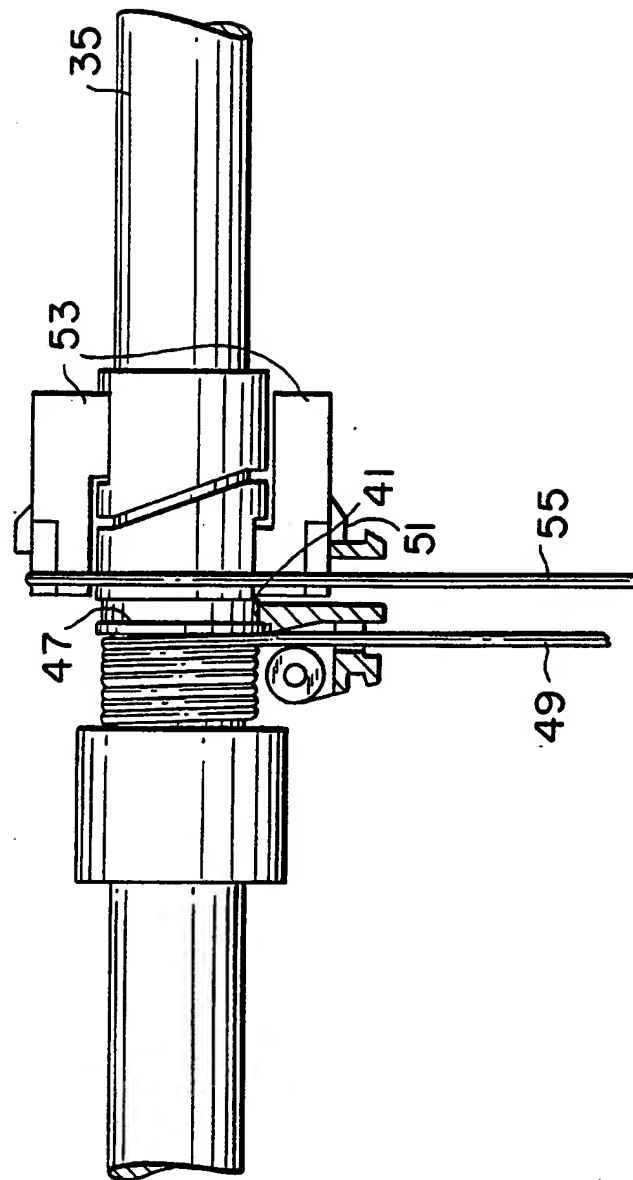


FIG. 6

*FIG. 7***SUBSTITUTE SHEET**

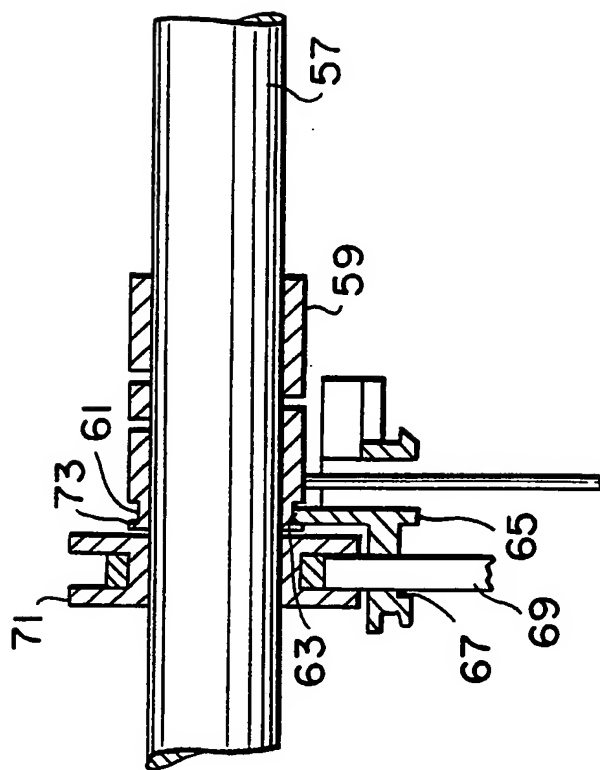


FIG. 8

## INTERNATIONAL SEARCH REPORT

International application No.

PCT/US92/06125

## A. CLASSIFICATION OF SUBJECT MATTER

IPC(5) :E06B 9/30

US CL :160/170

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS-SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 160/168.1, 176.1, 178.1, 171 160/170

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X Y	US, A, 4,697,630 (Rude) 6 October 1987 See entire document.	<u>1, 2, 4-10, 14</u> 3, 11-13
Y	US, A, 4,623,012 (Rude et al) 18 November 1986 See entire document.	3, 11-13
Y	US, A, 2,765,030 (Bechtler) 02 October 1956 See entire document.	1-9, 11-13
A,P	US, A, 5,123,472 (Nagashima et al) 23 June 1992 See entire document.	1-16
A	US, A, 3,352,349 (Hennequin) 14 November 1967 See entire document.	1-16
A	US, A, 2,250,106 (Lorentzen) 22 July 1941 See entire document.	1-16
A	US, A, 2,758,644 (Virilouvet) 14 August 1956 See entire document.	1-16

☒ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

* Special categories of cited documents:	*T* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
*A* document defining the general state of the art which is not considered to be part of particular relevance	*X* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
*E* earlier document published on or after the international filing date	*Y* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
*L* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	*Z* document member of the same patent family
*O* document referring to an oral disclosure, use, exhibition or other means	
*P* document published prior to the international filing date but later than the priority date claimed	

Date of the actual completion of the international search

01 SEPTEMBER 1992

Date of mailing of the international search report

29 OCT 1992

Name and mailing address of the ISA/  
Commissioner of Patents and Trademarks  
Box PCT  
Washington, D.C. 20231

Authorized officer

BLAIR M. JOHNSON

Facsimile No. NOT APPLICABLE

Telephone No. (703) 308-0526

## INTERNATIONAL SEARCH REPORT

International application No.  
PCT/US92/06125

## C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US, A, 4,200,135 (Hennequin) 29 April 1980 See entire document.	1-16
A	US, A, 2,737,235 (Hediger) 06 March 1956 See entire document.	1-16